

References for tensile strength of vitreous silica fibers at room temperature.

(Compiled by Andri Gretarsson, 7/99)

Many measurements have been reported on the breaking strength of fibers manufactured from naturally occurring, and synthetic, vitreous silica. Values reported for the tensile strength of fibers at room temperature vary greatly, from less than 100 MPa to about 9 GPa. (See Fig. 1.) The highest strengths are exhibited by untreated but carefully drawn and carefully handled, so-called “pristine,” fused silica fibers. With proper manufacture and handling, it seems possible to obtain extremely high tensile strengths, on the order of several gigapascals at room temperature, in fibers with diameters as large as 1 mm. Reduction in the strength is believed to be primarily due to microcracks induced by normal handling and abrasion rather than by cooling during manufacture or by aging.

References

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Reviews, and Books:

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- [11] F. M. Ernsberger, *Strength and Strengthening of Glass*, in *Research Into Glass*, Vol. 2, Glass Research Center, PPG Industries, Pittsburgh, 1970. *An excellent review article on the measured strength of glass in general.*

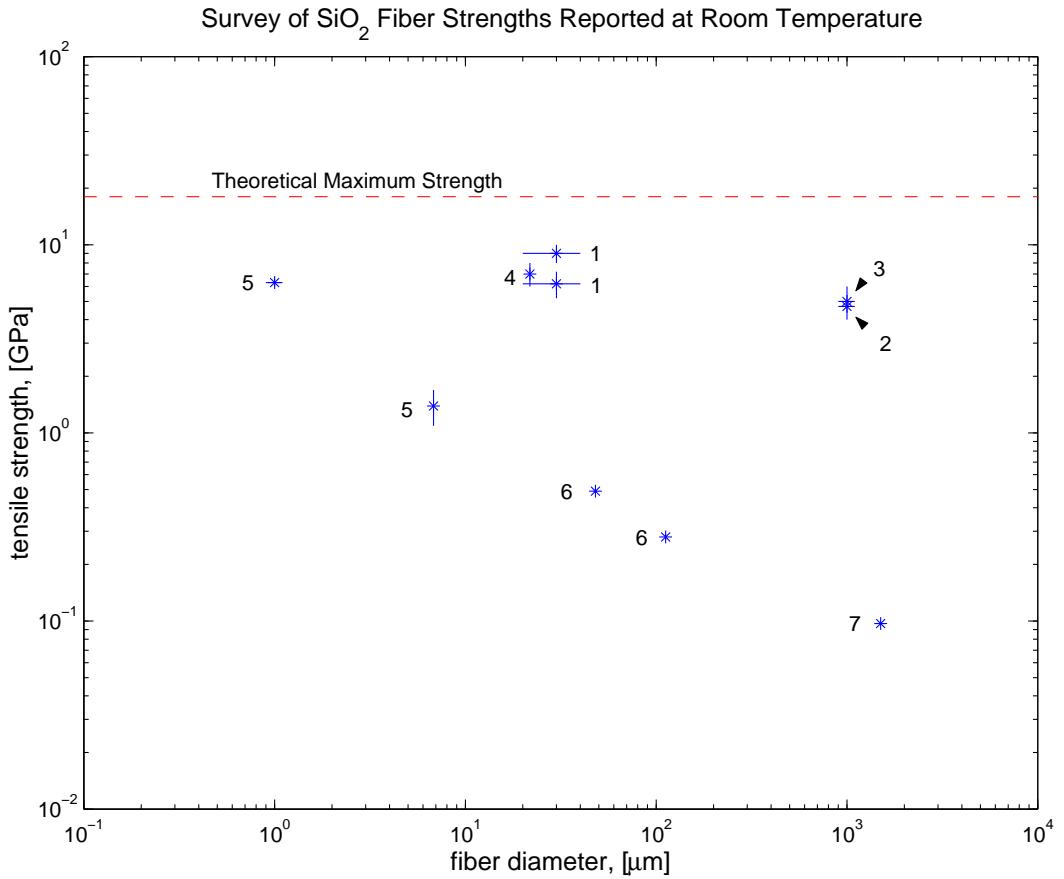


Figure 1: Tensile strength reported for vitreous silica fibers (synthetic fused silica and natural fused quartz) at room temperature. Numbers correspond to the references in which the values were reported. Error bars indicate the uncertainty quoted by the authors where this was available. Otherwise errorbars represent the last significant figure quoted by the authors or a range of values given by the authors when they did not provide a precise number. The theoretical maximum strength is calculated from the material bond strength, assuming homogeneous stress and pure SiO_2 .[9]